

# **DEVICE AND METHOD FOR FILTERING ADDED INFORMATION**

## BACKGROUND OF THE INVENTION

### Field of the Invention

8.1.7 The present invention relates to a MPEG-2 transport decoder, and more particularly, to  
device and method for filtering added information, in which PSI(Program Specification  
5 Information) in a transport stream is processed in an MPEG-2 system layer.

### Background of the Related Art

8.2.7 The MPEG-2, widely known as a moving picture compression method, has standards on  
a system layer for compression of an audio data, in addition to the moving picture data, and  
changing the moving picture data and the audio data suitable for transmission. The system layer  
10 has two systems, one is a TS(Transport Stream), and the other is a PS(Program Stream). While  
the PS system forms a pack by grouping a plurality of PES(Packetized Elementary Stream),  
reversely the TS system divides the PES for loading on a plurality of transport packets before  
transmission. That is, since the TS system transmits a plurality of video and audio individual  
bitstreams, the TS system requires information on selection of a program from a plurality of  
15 programs, and on selection of a packet, and on how to decode the packet, that is called as  
PSI(Program Specification Information). The PSI is transmitted by a packet having identification  
codes or a packet indicated by a primary PSI. In the MPEG-2 system layer, the PSI is one of  
element in the TS. In decoding and reproduction of the TS, one of the plurality of programs  
should be selected, and PIDs(Packet IDentification numbers) of the transport packets of the  
20 individual bitstreams required for the decoding and reproduction of the program should be  
known. Then, parameter information or linkage information of the individual bitstreams should  
be known. In order to conduct the foregoing multistage operation, a plurality of added  
information tables are required, which are transmitted by a data structure called as sections. Of

the plurality of tables, PAT(Program Association Table) is special information transmitted by a packet with PID=0. Every program number in the PAT has a description on elements of a relevant program, and particularly, has a PID of the transport packet which transmits a PMT(Program Map Table). The PMT describes a program PID, and a PID list and annex information of a transport packet which transmits individual video and audio bitstreams. In this instance, different from the PES which deals with ES(Elementary Stream), coded video or audio data, the PSI is provided with a redundancy for making fast access available since the PSI includes information on the program. That is, the PSI has identical information repeatedly for quick starting of decoding at any time. For example, standards of the ATSC(Advanced Television Systems Committee) requires transmission of information on PAT within at least 0.1 seconds, and on PMT within 0.4 seconds. That is, if the PAT is not available, there can be a problem in decoding since the information can not be identified as being a video or an audio. However, because there is no change in the information in most of the cases, information identical to the one transmitted before is transmitted. Accordingly, a general transport decoder has an algorithm for effective processing of such repeated data, one of which known widely is the section filtering defined in a DVB(Digital Video Broadcasting) standard. That is, the MPEG-2 has standards for four PSI tables each having a basic unit called a section, a combination of which forms one table. Information may be transmitted, with the information put in one section or a plurality of sections.

The sections have syntaxes of similar formats for convenience of hardware or software, of which, the following is a private section syntax.

```
private_section( ) {  
    table_id
```

}

In the section filtering, a filter is provided for several initial data bytes in a section for processing only sections each having a data at a particular position in the section which has the same value with a preset value. That is, a match data and a mask byte(or bit) are set up for data  
5 bytes at filtering positions, so that masked data only are compared to the match data, for storage in a designated position only when the masked data is the same with the match data.

FIG. 1 illustrates one example of an 8 byte section filter, wherein, in a case mask bit is '1', a section data of a corresponding byte(or bit) is compared to a match data, for processing only sections which is the same. 'A' type section filter in FIG. 1 illustrates a case when the mask is set up in bit units, and 'B' type section filter in FIG. 1 illustrates a case when the mask is set up in byte units. For example, it can be known that a comparison of data in the section 'A' in (a) in FIG. 1 to the match data in the 'A' type section filter with a mask bit of '1' in (c) is turned out that the two data are the same. In this case it is determined that the two data are matched, and the data in the section 'A' is received and stored in a designated position. In this instance, since the data in the section 'A' and the match data in the 'B' type sector filter with a mask byte of '1' in (d) are not the same, the B type section filter does not receive the data in the section A. That is, it can be known that the section A in (a) and the A type section filter in (c) are matched, and the section B in (b) and the B type section filter in (d) are matched. Of PSI sections processed and transmitted thus, a desired PSI can be selected and processed. In fact, a DVB standard requires  
20 at least 32 section filters each with at least 8 bytes.

However, because such a section filtering requires a large amount of hardware, and a host sets up the filter directly, load on the host is great, and the host may miss sections to be processed or waste the filter due to a time period required for doing this. That is, since unnecessary

portions of data, such as on section\_lengths, unused bits, and etc., in FIG. 1 are masked for comparison, wastes of the hardware are resulted in.

### SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to device and method for filtering added  
5 information that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide device and method for filtering added  
information, which can reduce a size of hardware.

Another object of the present invention is to provide device and method for filtering  
10 added information, which has an effective system.

Additional features and advantages of the invention will be set forth in the description  
which follows, and in part will be apparent from the description, or may be learned by practice  
of the invention. The objectives and other advantages of the invention will be realized and  
attained by the structure particularly pointed out in the written description and claims hereof as  
15 well as the appended drawings.

To achieve these and other advantages and in accordance with the purpose of the present  
invention, as embodied and broadly described, the device for filtering added information includes  
a memory for storing table IDs and version numbers of sections for each of the table IDs, a  
combination of at least one of the sections forming a table which added information defines, a  
20 comparing unit for determining match of a table ID included in the section and the table IDs  
stored in the memory upon reception of the section, and comparing the version number of the  
matched table ID to the version number of a received section number, and a section processing  
unit for receiving, and processing the present section if it is determined that the version number

stored in the table ID the same with the table ID of the section received from the comparing unit is not the same with the version number of the received section.

The section processing unit skips the section received at the present time if it is determined at the comparing unit that no table IDs are in match, or the version number stored in the matched table ID is the same with the version number of the received section.

The section processing unit automatically sets up a version value stored in the memory with a new version number when a section with a new version is received.

If it is determined that the table ID of the section received from the comparing unit presently is in match with the table ID stored in the memory, the section processing unit determines completion of the table of the version processed presently, and mask enables the version number of the section if it is determined that the table is completed.

The section processing unit skips the section received at the present time if the version number of the section received at the present time is mask enabled.

In another aspect of the present invention, there is provided a method for filtering added information for receiving only required sections using a memory for storing table IDs and a memory for storing version numbers of the sections separate for each of the table IDs, including the steps of (1) upon reception of the section, determining match of the table ID included in the section and the table IDs stored in the memory, (2) if it is determined in the step (1) that there are the table IDs matched, determining the version number included in the received section of being the same with the version number stored in a version memory of the table ID, and (3) if it is determined in the step (2) that the two version numbers are not the same, receiving and processing the present section.

The method further including the step of skipping the section received at the present time

if it is determined in the step (1) that there are no table IDs matched, or if it is determined in the step (2) that the two version numbers are the same.

The step of skipping the section is caused when the version number of the section received at the present time is mask enabled.

5 ~~as 7~~ The method further including the steps of (6-1) determining completion of the table of the version processed at the present time, if it is determined in the step (1) that the table ID of the section received at the present time and the any one of table IDs stored in the memory are matched, and (6-1) mask enabling the version number of the section if it is determined in the (6-1) step that the table is completed.

10 The step (3) further includes the step of automatically updating the version value stored in the version memory with a new version number upon reception of a section having the new version.

15 It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

#### BRIEF DESCRIPTION OF THE DRAWINGS

20 The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention:

In the drawings:

FIG. 1 illustrates an example of a related art section filter;

FIG. 2 illustrates a system of a hardware basis embodiment of a method for filtering



added information in accordance with a preferred embodiment of the present invention;

FIG. 3 illustrates a flow chart showing a method for filtering added information in accordance with a first preferred embodiment of the present invention; and,

FIG. 4 illustrates a flow chart showing a method for filtering added information in accordance with a second preferred embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 2, the system includes a table ID memory 22 for storing table IDs of sections, and a memory 21 for masking enable bits E for each table ID and versions to be masked. If a section 20 is received, a start of the section is searched for (S 301). If a payload unit\_start\_indicator is '1' in a TS packet having a PSI payload, the start of the section can be known from a pointer field. And, another section is started if the next data is not 0xFF after one section is ended. In this instance, a first byte of the section 20 is the table ID. Therefore, the

Referring to FIG. 2, the system includes a table ID memory 22 for storing table IDs of sections, and a memory 21 for masking enable bits E for each table ID and versions to be masked. If a section 20 is received, a start of the section is searched for (S 301). If a payload unit\_start\_indicator is '1' in a TS packet having a PSI payload, the start of the section can be known from a pointer field. And, another section is started if the next data is not 0xFF after one section is ended. In this instance, a first byte of the section 20 is the table ID. Therefore, the

table ID is compared to the table IDs stored in the table ID memory 22 .(S302) If there is a table ID matched, a version number assigned to the matched table ID is read from the version memory 21 for the table ID, if not, the present section is skipped. In the meantime, if there is a matched table ID, a masking enable signal 'E' is determined of being '1'. If the masking enable signal 'E' is '1', a version number in the section is compared to a version number in the version memory 21.(S 303) If the version of the present section is the same with the version in the version memory 21, and in a state of mask enable, the present version is masked. That is, the same data is received and stored, already. Therefore, in this instance, the present data is skipped(S 304). The masking enable signal 'E' is a flag for determining storage of the received section. If the present section in the step 303 is different from the version in the version memory 21 and there is no mask enable signal, the present section is either stored or processed(S 305).

FIG. 4 illustrates a flow chart showing a method for filtering added information in accordance with a second preferred embodiment of the present invention, wherein a start of a received section is searched for in the same method with the one shown in FIG. 3(S 401). Once the start of the section is found in the step 401, match of the table ID in the section and the table ID in the memory 22 is determined(S402). If it is found in the step S 402 that the two table IDs are in match, the version number stored in the version memory of the table ID and the version number of the section are compared(S 403). If it is found in the S 403 that the version of the present section is the same with the version in the version memory 21, and the mask enable bit 'E' is '1', the present section is skipped(S 404) as the present version is masked(S404). If it is found in the S403 that the version of the present section is different from the version in the version memory 21, and it is not in a mask enable state, the present section is stored or processed (S405). In the meantime, if it is determined in the S402 that the table IDs are in match,

completion of one table is determined(S406). The table is deemed completed if all sections of the table for the version processed presently is processed or no more sections are required. That is, completion of the table is verified on reception of section\_number and last\_section\_number from the received section. If it is determined in the S406 that the table is completed, a table completion bit 'C' of the table is set to '1', and if a version number automatic setting bit 'A' is '1', a received version number is stored in the version memory 21. The table completion bit 'C' is a flag set automatically for not processing the same sections of the version received after all the sections of one version is processed. And, the version number automatic setting bit 'A' is a flag for automatic updating of the version stored in the version memory to a new version when sections of a new version is received. That is, if it is intended to store a received version number in the memory 21, the version number is stored after the mask enable bit 'E' is set to '1' if the table completion bit 'C' is '1'.

The present invention suggests no algorithm for checking completion of the table. However, if the table has only one section, i.e., last\_section\_number is 0x00, the table can be provided with easy as the table is completed if the section received presently is processed. And, the present invention provides a flag which updates the version memory to a new version value upon reception of a new version, so that a rapid change of the version can be dealt with without participation of the host.

As has been described, the present invention can reduce hardware significantly in comparison to the related art section filtering. For example, sizes of a related art 8 byte section filter and a memory of the present invention are compared as follows.

If there are N section filters, the related art memory size M\_sec is

$$M_{\text{sec}} = N \times 8\text{bytes} \times 2 = 128N.$$

If N table IDs are version masked in the present invention, the memory size M<sub>ver</sub> is

$$M_{\text{ver}} = N \times 8\text{bits} \times 2 = 16N.$$

That is, it can be known that the size of the memory is reduced to 1/8. And, as the present invention can automatically set a version to be masked from the hardware, the sections can be processed without missing any section regardless of a performance of the host even if updated sections are received continuously. For example, it is assumed that there are three sections with version numbers 0x00, 0x01, 0x02 under the same table ID, and each of the sections forms one table. When sections with version numbers 0x00 are received continuously, then one section with version number 0x01 is received, and, in succession, sections with version numbers 0x02 are received continuously, a procedure for processing the three versions will be described.

8/27 In a case of the related art section filtering, the host set the filter such that the sections with version numbers 0x00 are processed at first, and then the section with version number 0x01 is processed. And, upon reception of the section with the version number 0x01, the section is stored through the filter. The host sets the filter such that the stored section is read and decoded, and, then, the sections with version numbers 0x02 are processed. However, in the aforementioned case, the long time period required for setting the filter for processing the sections with version numbers 0x02 may lead to miss a first section of the version number 0x02. However, since the present invention suggests to mask the section with version number 0x01 at the hardware as soon as the section with version number 0x01 is received, the next sections with version numbers 0x02 can be processed without missing any of the sections with version numbers 0x02.

Such a difference comes from the design of the related art section filtering in which required sections are selected, while the version masking of the present invention is designed to

abandon unnecessary sections. Since the present invention permits to process MPEG PSI effectively without employing 32 filters, the present invention can be applied to a transport decoder which uses an MPEG TS as a system layer. And, the application of the present invention to a system information field in other system layers permits reduction of hardware or intellectual  
5 decoding without participation of the host.

As has been explained, by applying the filter only to particular positions with great importance (table ID, version number) instead of general filtering, device and method for filtering added information of the present invention can reduce a size and complexity of hardware, i.e., memories, and by abandoning unnecessary sections instead of selecting required sections, an  
10 effective system can be provided, and missing sections which should be processed or wasting of the filter due to a time period required for setting the filter can be prevented. And, because reception of sections to the transport decoder is determined for reception of necessary sections only and abandoning unnecessary sections, which lessen a load on the host, a performance of the host can be improved.

15 It will be apparent to those skilled in the art that various modifications and variations can be made in the device and method for filtering added information of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.